Food Policy 41 (2013) 124–132

Contents lists available at SciVerse ScienceDirect

Food Policy

journal homepage: www.elsevier.com/locate/foodpol

The subsidization of farming households in China's agriculture

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ARTICLE INFO

Article history:
Received 4 August 2011
Received in revised form 21 April 2013
Accepted 27 April 2013

Keywords:
China
Subsidies

ABSTRACT

Concerned about national food self-sufficiency and rural household incomes, in 2004 China decided to reverse its longstanding policy of taxing farm households and instead began to provide them with subsidies. Since 2004, annual announcements have trumpeted rises in subsidies. Despite the historic turnaround of policy and likely implication of this subsidy policy to China's food economy, there has been little household level survey-based research that has sought to understand the nature of China's subsidy programs from the viewpoint of the farmer. Using data from two sets of household-based surveys (covering tens of thousands of households and most major producing provinces) and survey data from government, in this paper we examine the subsidies that are directly given to farmers, one of the newest and relatively high profiles components of China's subsidy programs. We focus on China's grain, input, seed, and machinery subsidy programs. According to the survey-based findings, we show that although agricultural subsidies per farm are low, on a per hectare basis the rate of subsidies is high. Almost all producers are receiving them. Subsidies are mostly being given to the land contractor, not the tiller. Most of grain, input and seed subsidies are non-distorting, but machinery subsidy is based on farmers' actual purchase of machineries.

Introduction

Although the involvement of China's government in the agriculture sector has long been pervasive (Sicular, 1998), the rise of subsidies that have been directed at farm households appeared in a noticeable way for the first time in the early 2000s and since have risen (Cheng, 2011; Huang et al., 2011; OECD, 2009, 2011). The move began by the government reducing, and then eliminating, the tax burdens of farmers in the early 2000s (Bernstein and Lu, 2003; Tao et al., 2004). Initially, however, there was little effort to provide subsidies or other transfers to farm households. As late as 2002 the total amount of subsidies targeted to farming households by the Ministry of Finance (MOF) was only 100 million yuan or 12.1 million US dollars (MOF, 2013). After 2003, however, things appear to have changed dramatically in the direction, quantity and nature of the payments. Between 2004 and 2011 subsidies from the MOF to the agricultural sector rose by many times (Fig. 1).

The rise in these expenditures had one other characteristic. According to the MOF, a large share of the new subsidy payments were supposed to have went directly to farmers. Government sources indicate there are four types of major subsidy payments, including "grain subsidy" (in Chinese—*liangshi butie*), "input subsidy" (*nongzi zonghe butie*), "quality seed subsidy" (*liangzhong butie*), and "agricultural machinery subsidy" (*nongjiju butie*). The first two subsidy payments accounted for 82% of total subsidies in 2008 and 74% in 2011.

While there has been increasing attention regarding China's shift from a taxer of agriculture to a subsidizer and the rising level of investment (both direct farmer subsidies and other allocations of state funds to agriculture—Gale et al., 2005, 2009; MOF, 2004; OECD, 2009), there has been only limited research based on household-level, primary survey data that seek to measure the amount of the funds that directly reach farmers. According to a United States Department of Agriculture (USDA) report about China's agricultural subsidies (as summarized in Petry and Chandlee, 2009), there have been few comprehensive studies on China's subsidy policy. One of main barriers to understanding China's agricultural subsidies is lack of access to data about the nature of subsidies at the farm level. The USDA report asks a number of questions that are also raised in the literature (e.g., Gale et al., 2005). Are farmers actually receiving the subsidies? Who is receiving the subsidies? How are subsidies being allocated and given to farmers? Are the subsidies being given in such a way that they are tied to the farming decisions of farmers?

The overall goal of this paper is to provide answers to the above questions on the nature of China's farm subsidy program. We do so

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http://dx.doi.org/10.1016/j.foodpol.2013.04.011

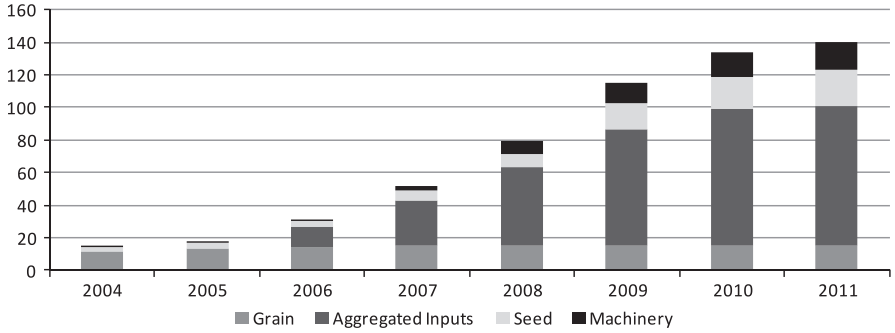

Fig. 1. Agricultural subsidies (billion yuan) in China, 2004–2011. *Source*: National Bureau of Statistics of China (NBSC), 2005–2012.

using an empirical approach. Specifically, we use several large, nationwide (or regional) sets of household data and seek to understand if farmers are, in fact, receiving the subsidies, which types of households are receiving them and how much they are getting. We also have gained access to a large, national database and use information on the level of the cost of production as a way to gauge the size of subsidies. In total, we examine the level and nature of the implementation subsidies on China's grain and input subsidy program, seed subsidy program and machinery subsidy program. The discussion of grain and input subsidy covers major grains (rice, wheat, maize) and soybean and agricultural inputs for all crops. For China's seed subsidy program, we use cotton as an example because we only have household data on cotton seed subsidies. In this sense, the paper contributes to an understanding of the support of China's government to the agricultural sector by enumerating the part of the subsidy program that goes directly to farmers.

To accomplish these objectives, the rest of the paper is organized as follows. The first section reviews the data (and refers to a larger appendix with more detailed information for the interested reader). The following section identifies the scope of China's agricultural subsidy programs and how they are administered. To examining this, we proceed on a program by program basis (grain and input subsidy program; seed subsidy program; machinery subsidy program). The analysis of each program includes whether or not the subsidy is linked to output (or inputs or how it is given); the nature of how the subsidy is given (i.e., how the farmer or supplier receives the subsidy); and, if the farmer received the subsidy at all. The final section concludes.

There are important limitations to our study. This paper is not an attempt to enumerate all of the subsidies on all of China's crops and commodities. In addition, although we have a nationally representative sample (and access to a large dataset collected by the national government), we do not have data on all types of farms; all scales; all levels of commercialization; in all provinces of the nation (indeed, China's own national statistical service only collects national income statistics from a small fraction of all counties). Because of that most of our production data are from (and mostly about) farm households. This is, of course, not surprising (and should not be viewed as too great of a shortcoming) due to the fact that most of China's output is from the more than 200 million smallholders that dominate production of about every commodity. However, we recognize that in many cases the government is concentrating investments and providing indirect support to a minority of large farms and agricultural corporations. We acknowledge that we do not pick up these. There are also a host of other ways that China is participating in the development of the agricultural sector (e.g., loans for downstream agricultural marketing enterprises; direct support for farmer cooperatives and firms that are often involved in input supply; the creation and extension of new technologies; highly subsidized agricultural insurance, etc.). Finally, in the case of grain (and other) subsidies, we do not analyze (econometrically) the impact on production; for details on this important issue, see Huang et al. (2011).

Datasets

In this paper, we primarily draw on two sets of primary data and two sets of secondary data (that we gained access to for this study). Datasets 1 and 3 are primary data. Datasets 2 and 4 are secondary data. All of the data sets have the characteristic that the data are based on and/or report household level observations.

Dataset 1 (grain, input and machinery subsidies national dataset, 2007 and 2008)

The data for Dataset 1 were collected by the authors in a randomly selected sample of 1064 households from 58 villages in 6 provinces of rural China that were selected to represent all of China's major agricultural regions (henceforth, the 2008 China National Rural Survey or the 2008 CNRS).[1] We gathered detailed information on household production activities by plot at the time of the survey (2008) and the sown area of each crop in 2007 and 2008. Analysis of the characteristics of these households demonstrate that they are nearly the same (in terms of their characteristics) as households that are interviewed as part of the much larger China National Bureau of Statistics annual Household Income and Expenditure Survey (details available upon request to the authors).

Information was also collected on the land tenure of each plot and subsidies received by the households. Because farmers sometimes were not certain about the amount of subsidies they received during the 2 years (2007 and 2008), we first asked each respondent if they knew the value of the subsidy or not. If they said no, there was no way to ask the amount. If they knew the amount of the subsidy, they then told us the amount that they received. We tried to get the households to divide the subsidies between grain subsidies and input subsidies. Because in many cases they could not—especially for 2007 (they often called all of their subsidies "grain subsidies"), we collected grain subsidies for 2007 and 2008; and input subsidies (when available) for 2008.[2]

The survey instrument also had a section that was designed to collect data on machinery subsidies. Enumerators asked farmers if they owned different types of agricultural machinery. If they did, the date of purchase was asked. Finally, a listing of direct subsidy payments for agricultural machinery was enumerated.

[1] The provinces are Hebei, Liaoning, Shaanxi, Zhejiang, Hubei, and Sichuan. There were five counties per province. Importantly, in China, unlike in many countries, since almost every household in rural areas has access to land, a household survey and a survey of farms is almost the same thing.

[2] Recall that China has four major types of staple crops: rice, wheat, maize and soybeans. When we discuss grain subsidies, we are including these four crops.

Dataset 2 (national cost of production dataset, 2003–2008)

To create this dataset we use data that have been collected every year between 2003 and 2008 by the National Development and Reform Commission, China.[3] Using a sampling framework with more than 20,000 households, enumerators collect data on the costs of production of all of China's major crops. The dataset contains information on quantities and total expenditures of all major inputs, as well as expenditure on a large number of miscellaneous costs. Each farmer also reports output and the total revenues earned from the crop. Provincial surveys conducted by the same bureau supply unit costs for labor that reflect the opportunity cost of cropping, or the daily wage foregone by farmers that work in cropping.

Most importantly for us, during the recent years that this dataset has been collected and published enumerators have also collected information on subsidies. These data are reported in the reports and include information on national aggregates for 2003–2008 for all major crops. In 2008 we have access to "by province" data for the major crops.

Dataset 3 (cotton seed subsidies in North China, 2008 and 2010)

The data used in this study are from a database collected by the Center for Chinese Agricultural Policy (CCAP), Chinese Academy of Sciences. The data from the first round of data collection on subsidies were collected in 2008 for activities in 2007. In 2008 the surveys covered 8 villages in 4 counties in 3 provinces, Henan, Shandong and Hebei.

Villages and households included in the study were randomly selected. In each village 20 farm households were selected by the survey team from a comprehensive list of all farming households in the village, which was provided by the local household registration office. Each farmer was interviewed by trained enumerators from CCAP's survey team.

The focus of the 2008 surveys was on seed subsidies (among other things). Enumerators asked farmers about their total sown area. They also asked whether the household received a seed subsidy and for how much sown area they received the subsidy. They asked the amount. Finally, a series of questions were asked about how the seed subsidy was given to them.

Dataset 4 (Ministry of agriculture cotton seed subsidy dataset, 2007)

In the second year after the launch of cotton seed subsidies, the Ministry of Agriculture collected a separate dataset on cotton seed subsidies. The data covered eight major producing provinces. Information includes the area being subsidized, the amount of the seed subsidy, the total sown area of cotton farmers that received the subsidies and an estimate of the share of their sown area that is being subsidized.

Agricultural subsidies in China

In this section we first look at grain and input subsidies. We then examine seed subsidies using cotton as a case study because the nature of seed subsidies is similar across crops. Finally, we analyze machinery subsidies.

[3] To some non-public reasons, the data on subsidy published by National Development and Reform Commission, China are only up to the year of 2008 started from 2003.

Grain (rice, wheat, maize and soybeans) and input subsidies in rural China

One of the difficulties in understanding the impacts of subsidies is that the allocation process varies as the subsidies move from the central government down to the grassroots level. According to the policy, the allocation of the subsidy budget is implemented in a three step process (MOF, 2004). First, the total budget that is to be allocated for grain and input subsidies for the whole nation (and on a province by province basis) is determined annually by the State Council. Provinces with higher grain production are supposed to receive more subsidies. The MOF announces the total amount of subsidies early each year.

Step two occurs at the provincial level. The provincial departments of finance follow a similar approach to the national MOF. They set up an account with the centrally provided subsidy transfers. They then divide the total amount of the subsidy among the counties on the basis of each county's grain production.

The final step of the allocation process is for county-level financial bureaus to determine a standard or criterion (or criteria) by which the subsidy will be passed onto households. Although policy guidelines from MOF suggest that the amount of subsidy received by each household should depend on the area of each household's plot that is devoted to grain, the policy also clearly states that local governments can decide how best to allocate the subsidies to households "based on the locality's actual situation" (MOF, 2007). According to the policy, however, localities absolutely must disburse to households all of the funds that it is allocated. Grain and input subsidies cannot be allocated to enterprises or local governments.

Local governments can allocate subsidies based on one or more of the following criteria (MOF, 2004): (a) the amount of contract land that a household was allocated in the late 1990s;[4] (b) actual grain sown area; or (c) a somewhat antiquated measure, the taxable grain production target during a normal year (in Chinese *jishui liangshi changnian chanliang*).[5] It is obvious that grain production could be affected by the way in which grain subsidies are allocated to farmers by local officials. However, while the criteria that can be used by localities to allocate grain subsidies to households are clear, the government does not compile information on what methods are used at the provincial/county level and how subsidies are allocated to households by commodity.

The transfer of subsidies to each household

While the criterion (or criteria) by which local officials allocate subsidies to households is unclear, the method for physically transferring the money to households is supposed to be set by policy directive (MOF, 2009). In almost all provinces, the subsidy is transferred to each household through the banking system by the county's Financial Bureau. In fact, according to our data, in almost every county in our sample, the government sets up a special account for each household in a local bank. Each household is allocated a Current Deposit Book (Card) for accessing the annual

[4] In China, contract land is cultivated land that is allocated by the village leadership council (which is the formal owner of cultivated land) to each farm household in the village. Use rights are bestowed on the land contractors. Farmers do not need to pay any compensation for use of the land. At the end of the contract period (which according to the 2003 Rural Cultivated Land Contracting Law is 30 years from 1998), the farm household returns the cultivated land to the village for reallocation.

[5] This last measure is a leftover from the period in Chinese history when farmers were responsible for delivering an in-kind grain tax to the state grain procurement system. Each individual and locality (village/town and county) was assigned a target, called the taxable grain production target, in a normal year. Households were assigned *mandatory delivery quotas* (Sicular, 1988). Although this system was discontinued in the mid-1990s and grain delivery quotas were phased out during the late 1990s, localities still have records of each household's "target".

Table 1
Percentage of households that report receiving grain and input subsidy, by province in 2008 (%). *Source*: Authors' own survey (Dataset 1).

Province	Sample	Percentage of HHs that report receiving grain and input subsidy
	No. of HHs	%
Total	1064	83.9
Hebei	194	96.9
Shaanxi	178	84.8
Liaoning	184	93.5
Zhejiang	183	53.0
Sichuan	155	89.7
Hubei	170	85.9

allocation of the Agricultural Financial Subsidy Funds. After the funds arrive at the local bank, a notice is supposed to be sent to each household.

The timing of transferring the subsidy funds to farmers is important. The funds are transferred to farm households near the time that they are making their planting decisions and not at the end of the season when they are marketing their crop. While there are no specific policy directives on the timing of the issuance of subsidies from the government to farm households, they typically are given out in the spring before the planting season in order to help farmers finance the expenses for the upcoming season's crops.

Grain and input subsidies in China—an empirical description

Most households in rural China are receiving a subsidy from the government (Table 1, panel A, column 2). Out of our sample of 1064 households, 893 households, or 83.9% of households in our rural China sample, reported receiving grain subsidies. This means, of course, that most people in rural China are benefiting from the subsidy program.

It was more difficult to identify the number of households that receive input subsidies from our data. Only 263 households said that they received input subsidies, much lower than the 893 households that reported receiving grain subsidies. According to the MOF's website, most of the households that received grain subsidy should also have received input subsidies.

So, why do we observe this difference? There are two interpretations. The first is that households that were supposed to get input subsidies did not receive them (while they did receive the grain subsidies). The other explanation is that they received the input subsidies but they thought they were receiving a higher grain subsidy. Our data support the second explanation. According to the MOF's website, all of the increase in subsidy between 2007 and 2008 should have been in the form of an input subsidy; the grain subsidy did not increase. Most households (over 80%) reported that their overall subsidy (or grain subsidy) increased in 2008 over 2007. Only 42 of the 263 households (16%) knew about their input subsidies. However, as in the case of grain subsidies, they also reported that they did not know the value of the input subsidy.[6]

Who did not receive grain subsidies? Of the total number of sample households (1064), 85% received a subsidy (83.9% claimed they received grain subsidies and 1.1% claimed that they received input subsidies but not grain subsidies). This means that 15% of the households reported that they did not receive the subsidies. Our results mirrored the conclusions of a study conducted by researchers in the Ministry of Agriculture (MOA, 2010, 2011). Using their own data set, it was found that around 85% of households received grain subsidy; two thirds of households received input subsidies.

A closer analysis of our data demonstrates that, in fact, there are only a few "types" of households that do not receive the subsidy. First, of the 15% of households that did not receive a subsidy, one fourth of them (or 4% of the total number of households) did not have any contract land. This is consistent with the linkage of grain and input subsidies to contracted land holdings in most regions.

In contrast, 11% of the total number of farmer households in our sample (or 75% of those that did not receive the subsidy) had contract land but did not receive a subsidy. Interestingly, about half of the households with contract land but no subsidy actually cultivated grain, said that they just did know about the subsidy. At least one household received the subsidy in each village.

The size of producer subsidies (grain + input) in rural China

The level and growth rate of subsidies going to China's farming households increased significantly between 2007 and 2008 (Table 2). Based on data from farmers who could report the value of their subsidies, the government provided the typical farm household 273 yuan in grain subsidies in 2008. During the survey households reported that the typical farm household also received 169 yuan in input subsidies. Of the households that reported receiving either grain or input subsidies or both, the typical household received 327 yuan. Consistent with the studies by MOA (2010, 2011), our results also indicate that amount of grain and input subsidies varied significantly across provinces. If the average rural household earned 19,044 yuan in 2008 (4761 yuan on a per capita basis, assuming that the average household has four members), then 1.7% of household income was from subsidies. When doing the calculations with the level of income at the poverty line (785 yuan per capita for the extreme poverty line; 1067 yuan per capita for new national poverty line), if the poor were getting as much in subsidies as the average farmer, 10.4 (for the extreme poverty line) or 7.6% (for the new poverty line) of household income would come from subsidies.

When looking at subsidies on a per land area basis, however, it is clear that China is becoming a major subsidizer in world terms. Since the average household had 8.4 mu of contract land, this means that they received 39 yuan per mu in 2008. Converting to US dollars (6.8 RMB = 1 US dollar) per acre (6 mu = 1 acre), demonstrates that the farmers received 34.4 US dollars per acre in 2008. During the same year (2008), the typical farmer in Illinois (a typical Midwest state in US) received 30–50 US dollars per acre. Of course, since the average farmer's land holding in China is only a fraction (1/315) of that of the farmer in the US, the average per household subsidy is still much lower in China.

Cost of production data (Dataset 3) and subsidies for grain production

Table 3 contains information on subsidies on rice, wheat, maize and soybeans from 2003 to 2008. The trends for all are rising rapidly, on average, from 5 to 13 yuan per mu (about 4–10 US dollars per acre) in 2004 (the second year of the subsidy program) to around 43–57 yuan per mu (36–48 US dollars per acre) in 2008. Although the trend for all crops was about the same, the value of the subsidy for rice was typically the highest while the value of the subsidy for maize was typically the lowest. The data from the cost of production survey are similar (though a bit high) to those levels that we see from our own data.

[6] Is it noteworthy that households could not tell us the value of their subsidy? The inability to report the value of input subsidies is reminiscent of survey questions (in the 1990s) about taxes and fees. When taxes and fees were deducted from grain sales, farmers often did not know how much they were paying. In the case of subsidies, more than 85% of households said the subsidies were wired directly to their bank account. As discussed in the footnote above, there could be many reasons why farmers did not know the value of their subsidies. Many just did not bother to check the exact value of the transfer before they had it transferred to their other bank account and it became mixed in with their other savings. Others simply forgot. Farmers' uncertainty over the amounts of their subsidies is a hint that input subsidies may not be distorting. The logic of drawing such a conclusion is simple: how can subsidies be distorting if farmers do not even know how much they are receiving?

Table 2
Grain and input subsidies reported by households that claimed to know the amount of grain or input subsidy in 2007 and 2008 (Yuan/Household).

Province	Grain subsidy					Input subsidy		
	Sample	Grain subsidy in 2007		Grain subsidy in 2008		Sample	Input subsidy in 2008	
	No. of HHs	Mean	Std. dev.	Mean	Std. dev.	No. of HHs	Mean	Std. dev.
Total	718	178	334	273	395	185	169	171
Hebei	119	185	199	300	247	20	189	210
Shaanxi	129	116	108	230	160	17	76	175
Liaoning	166	374	288	512	349	21	31	85
Zhejiang	65	165	871	286	974	3	30	52
Sichuan	133	50	58	56	83	102	229	158
Hubei	106	107	112	182	166	22	91	109

Note: The calculations in columns 2 and 4 are based on the households that claimed to know the amount of grain subsidy in 2007 and 2008. The calculations in column 7 are based on the households that claimed to know the amount of input subsidy in 2008. *Source*: Authors' own survey (Dataset 1).

Table 3
Total value of output, costs, profits and subsidies for rice, wheat, maize, soybeans and cotton in China (Yuan/Mu), 2003–2008. *Source*: National Development and Reform Commission, China, 2004–2009 (Dataset 2).

	2003	2004	2005	2006	2007	2008
Rice						
Total value of output	513.96	739.73	686.02	720.6	784.29	900.72
Total cost	416.66	454.64	493.31	518.23	555.16	665.1
Net profit	97.3	285.09	192.71	202.37	229.13	235.62
Subsidy	1.47	13.08	12.83	20.31	28.42	56.87
Wheat						
Total value of output	309.36	525.5	468.96	522.46	563.91	663.06
Total cost	339.64	355.92	389.64	404.77	438.61	498.55
Net profit	−30.28	169.58	79.35	117.69	125.3	164.51
Subsidy	0.58	5.21	8.32	15.64	24.77	47.69
Maize						
Total value of output	410.41	510.64	487.82	556.53	650.52	682.67
Total cost	347.63	375.7	392.28	411.77	449.7	523.45
Net profit	62.78	134.94	95.54	144.76	200.82	159.22
Subsidy	0.13	6.7	8.36	13.78	21.6	43.01
Soybeans						
Total value of output	366.38	380.11	352.02	335.37	466.96	526.44
Total cost	254.65	253.05	270.54	267.53	291.75	347.99
Net profit	111.73	127.06	81.48	67.84	175.21	178.45
Subsidy	0.09	7.67	8.64	15.68	23.11	46.12
Cotton						
Total value	1138.71	966.15	1122.86	1206.07	1353.48	1063.26
Total cost	1018.80	743.10	791.50	870.35	965.56	1079.97
Net profit	461.28	223.05	331.36	335.72	387.92	−16.71
Subsidy	0.13	0.04	1.67	4.01	11.51	21.78

Summary—grain subsidies and input subsidies

In summary, grain and input subsidies are large (on a per acre basis) and growing over time. They are approaching the level of US producer subsidies on a per acre basis. However, the mechanism for giving subsidies is different in China. In most cases subsidies are given to the farmers on the basis of the amount of their contract land (MOF, 2004). According to our data, in most of the survey areas farmers that produce grain and farmers that do not produce grain; farmers in large grain producing provinces and farmers in provinces that do not produce a lot of grain are all getting these subsidies. These conclusions (of our study and the MOA study) are also consistent with the study by Chen (2011). In that study it was found that most farmers received subsidies but farmers did not know much about the level or nature of the subsidies. Furthermore, grain and input subsidies are kind of an income transfer and they do not appear to have distorted the production decisions of China's farmers (Huang et al., 2011). The contractor (that is the person to whom the land was contracted for 30 years) gets the subsidy even if he is a migrant living in the city and never goes back to his hometown.

Seed Subsidies

China's seed subsidy program was launched for soybeans in 2002 and has gradually expanded to other major crops thereafter (MOA, 2008). The second crop targeted by China's seed subsidy program was wheat in 2003. Total allocation of funds to the seed subsidy program was 0.1 billion yuan in 2002 (12.1 million US dollars) and 0.3 billion yuan in 2003 (36.3 million US dollars). Since 2004, two other major grain crops, including rice and maize, have also been covered under the seed subsidy program. After 2007, the program was further expanded to cover other crops, including cotton, rapeseed and peanuts. The amount of the seed subsidies has risen steadily over time from 2.85 billion yuan (345.03 million US dollars) in 2004 to 22.4 billion yuan (3.58 billion US dollars) in 2012 (Fig. 1). In terms of subsidy amount per unit area, the amount of seed subsidies ranged between 10 yuan/mu and 15 yuan/mu across crops (MOA, 2008).

While there are differences among the crops, there are similarities in the ways in which the subsidies were implemented in the initial years and the way that the subsidy programs have evolved

over time. The goal of the seed subsidy program is to facilitate the adoption by farmers of new and high quality varieties. To meet this goal, in the first several years of most seed subsidy programs the subsidies were given indirectly. In a given county/region, agricultural officials announced a list of companies that were authorized to sell subsidized seed as well as the specific varieties of seed that were to be subsidized. If farmers purchased those particular seeds from the authorized dealers, farmers would receive a discount at the time of purchase. They would also sign the registry of the seed seller certifying that they had purchased the subsidized seed. The seed seller would then take this registry of sales to the local bureau of agriculture and be paid an amount that would cover the discount.

In recent years the nature of the seed subsidy program has evolved (MOF, 2012). Because of irregularities in the implementation of the program, China's agricultural officials decided that they would give the seed subsidy directly to the farmer. Essentially, the approach is to identify a county/township which is a key cotton-producing county (or a key-rapeseed producing county/township; etc.). After this, all farmers in the county/township, regardless of the area planted to the particular crop (even zero), received the subsidy (MOF, 2012). In this way the seed subsidy has become more like China's grain and input subsidies (as described in the section above).

The case of cotton: In this section, we review the case of cotton as an example of China's seed subsidy program. While there would be differences if we examined other crops, we believe that the similarities among the seed subsidy programs are greater than the differences. To present this case study, we draw on two sets of data (Datasets 3 and 4) and use these data to demonstrate the nature of cotton seed subsidies.

The nature of seed subsidies for cotton

With such a comprehensive system of grain and input subsidies (that is, almost all farmers were receiving grain subsidies), why was an additional seed subsidy needed for cotton, rapeseed, peanuts and other crops? The answer (at least for cotton) almost certainly can be found by comparing trade and production statistics between 2002 and 2006 (NBSC, 2003–2007). During the 2000s, cotton imports soared. Starting from 0.18 million tons in 2002, the first full year after China's accession to the WTO, cotton imports had risen to 3.64 million tons by 2006, a growth rate of 112% annually. Although China's own cotton output also grew during this period (8% per year between 2002 and 2006), it grew at a much slower rate than did cotton imports. In addition, at the same time as the rapid expansion in China's textile industry, which relied on both imported and domestic cotton, textile factories were also gradually moving up the quality ladder (Lin et al., 2011). As manufacturers sought to produce high quality textiles, demand for high quality cotton rose. Most of this cotton, however, could not be produced domestically.

It was against this background that the Ministry of Agriculture decided to launch a program targeted at upgrading the quality of the cotton varieties used by China's cotton producers. In 2007 the MOA and MOF announced that China would begin a program to provide a subsidy to the producers of high quality cotton seed (MOA, 2008). The program, as initially designed, selected a number of cotton seed companies that were capable of creating, replicating and marketing varieties of high quality cotton. Only the designated high quality varieties were eligible for the subsidy. The program in the first 2 years made a deal with the designated seed firms. If any farmer purchased the designated variety, the farmer would receive a receipt from the seed company confirming as such. The receipt indicated both the quantity of the seed purchased (in kilograms) and the number of mu the seed could produce. Once purchased, the farmer could take the receipt to the local agricultural station in township and be reimbursed 15 yuan for every mu worth of seed purchased. For example, if a farmer purchased 2 kg of cotton seed that could be used to sow 2 mu (0.133 ha), he could receive 30 yuan back from the township agricultural station. The company benefited through an increased sales volume. Seed costs were typically between 40 and 60 yuan per mu in 2011, so the seed subsidy was only enough to offset part of the cost of seed, typically a little more than half.

While subsidies are almost always welcomed by farmers, interviews with farmers, seed companies (designated and undesignated) and local officials indicated that after years of experience with the program, several problems were encountered. First, some farmers complained that their favorite seed, which they believed was of higher quality, was not designated for reimbursement under the subsidy program. Second, farmers often spent large amounts of time trying to track down designated local seed-selling enterprises that were supposed to sell the high quality, subsidized seed, only to discover that the firms could not be found or had already sold all of the seed. There were also cases of corruption in which seed companies gave out receipts for seed even though the farmers had never purchased it. Finally, because not all seed firms were designated as subsidy-eligible seed distributers, seed firms would frequently come into conflict with one another and expend significant amounts of effort to try to earn the designation status. Often the efforts did not include producing higher quality cotton seed.

In response, national officials decided to revamp the program in 2009. The national government began to deposit cotton seed subsidies directly into the bank accounts of producers in cotton areas in 2009, much like was occurring for the grain and input subsidies. Also, like the grain and input subsidies, this method of disbursement was given to all producers in designated villages, towns and counties, regardless of whether the producer purchased cotton seed. There was not even a requirement of proof that the producer cultivated cotton. Indeed, in 2008, during our field work to collect Dataset 3, we also conducted village surveys with the village leaders about the nature of seed subsidies within the village. The evidence from the village survey shows that, although many farmers in villages that received seed subsidies actually produced cotton (and received the cotton seed subsidy transfer), there were other farmers that we surveyed that also received the cotton seed subsidy that did not produce cotton. According to an interview with a top level government official, there was a perception that the program as originally designed was too prone to corruption and that too many of the program benefits were not enjoyed by farm households. It is recognized that the new method of disbursing the funds does not ensure the production of high quality cotton varieties (in exchange for the subsidy), but it does ensure that nearly 100% of the program money entered farmers' bank accounts.

Coverage and size of seed subsidies

For the most part, the data from a number of our datasets tell a consistent story. In 2007, the first year that the subsidy program was implemented across wide reaches of China's cotton production areas, many, but not all, farm households were able to take advantage of the subsidies by adopting designated varieties (Table 4, panel A). In each of the four counties of the sample (Dataset 3), we interviewed 40 cotton-producing households. Of this between 6 and 18 households (15–68% of total sampled households) adopted varieties that made them eligible for subsidies (columns 1 and 2). The households that did not adopt the designated varieties either said that they did not want to use any of the designated varieties or that they had not been able to find any of the types of seeds that received subsidies. Of the households that did adopt the designated varieties, the average household adopted them on an area that ranged from 2.1 mu (0.14 ha) to 4.7 mu (0.31 ha—column 3).

Table 4
Cotton seed subsidies in selected sample provinces, 2007. *Source*: Authors' own survey (Dataset 3); MOA (2008) (Dataset 4).

Panel A. Cotton seed subsidies in 160 cotton-producing households in Henan, Shandong and Hebei Provinces, 2007 (Dataset 3)				
County	Sample (1) No. of HHs	HHs that have received subsidies by adopting designated varieties (2) No.	Of HHs in (2), cotton area planted to designated rarities (that received subsidies) (3) Mu (Ha)	Of HHs in (2), share of total cotton area sown to designated varieties (4) %
Taikang, Henan	40	18	3.2 (0.21)	81.1
Fugou, Henan	40	6	2.1 (0.14)	62.5
Xiajin, Shandong	40	16	3.8 (0.25)	41.5
Shenzhou, Hebei	40	27	4.7 (0.31)	67.8
Panel B. National seed subsidies for cotton in China's main producing provinces in 2007 (Dataset 4)				
Province	Subsidy area (1) 1000 Ha	The amount of subsidy (2) Million Yuan	Sown area (3) 1000 Ha	The proportion of subsidy area[a] (4) %
Hebei	253	57.0	680	37.3
Shandong	420	94.5	900	46.7
Henan	396	89.0	700	56.5
Jiangsu	127	28.5	327	38.8
Anhui	133	30.0	376	35.5
Hubei	133	30.0	514	25.9
Hunan	53	12.0	172	31.0
Xinjiang	707	159.0	1783	39.6
Total	2222	500	5452	

[a] Column (4) = column (1)/column (3).

Note that the cotton subsidy program did not require the participating farmers to replace all of their cotton production with the designated varieties. Of those households that participated in the program, between 42% and 81% of the total area planted with cotton was planted with the designated varieties (column 4).

In another part of the survey (Dataset 3) we asked the households that received cotton seed subsidies how much they received for each mu that they planted with the designated cotton varieties. All households responded that they received 15 yuan per mu. This means the subsidy was about 12 US dollars per acre. Such consistency almost certainly was due to the fact that the program was widely promoted by the central government's Ministry of Agriculture. Farmers knew how much they were supposed to receive. Farmers said that they saw advertisements on television, heard advertisements on the radio, were told by their village leader, and saw posters in the seed and other input (e.g., fertilizer) shops. All information sources indicated that the subsidy was 15 yuan per mu (which was exactly what they received).

Secondary data also support the widespread nature of the program. In Dataset 4, which was collected by the Ministry of Agriculture in 2008, the program area was over 100 thousand hectares (more than 1.5 million mu) in each of the seven of the eight sample provinces (Table 4, panel B). In total, in the eight selected provinces farmers cultivating over 2 million hectares were documented as receiving subsidies. The amount of the subsidies was over 500 million yuan. This is almost exactly 15 yuan per mu. Even the official dataset documented the voluntary, partial nature of the program. On average, farmers planted around 35–40% of their total cotton area with designated varieties.

The most comprehensive dataset, though it documented all subsidies given to cotton farmers and not just cotton seed subsidies, is Dataset 2, the National Cost of Production data. The subsidies to cotton producers in this dataset included all subsidies received by cotton producers, except for grain subsidies, with one exception: if the cotton farmers did not produce any grain crop (that is, they only planted cotton), the grain and input subsidies were counted at part of the subsidy to cotton producers. It is because of this that the total amount of per mu subsidy was able to exceed 15 yuan (the criteria of the disbursement of cotton seed subsidies).

According to the data from Dataset 2, subsidies to cotton producers rose from almost zero (0.13 yuan per mu) in 2004 to 21.78 per mu in 2008 (or about 18 US dollars per acre—Table 3, bottom four rows). In all of the cotton producing households, after 2007 more than three-quarters of their total subsidies came from the high quality cotton seed subsidy program. While the reported figure, 21.78, is higher than the averages reported on the basis of other datasets, the differences, which are slight, are likely due to reporting errors of households.

Machinery subsidies

In the past decade or so, there has been a sharp rise in the level of mechanization (Ji et al., 2012). Although published statistics do not always capture this well, they do give a rough indication of the increased prevalence of the use of machines in China's agricultural sector. For example, according to the National Bureau of Statistics of China (1991 and 2009), the quantity of land cultivated by machine (*jigen mianji*) rose by 3.6% per year between 1990 and 2008.

What types of households are investing in agricultural machinery? Because farm size is so small (only 0.6 hectares per farm—versus more than 500 hectares per farm in the US), there is no way that a household can afford the machinery necessary to plow, plant and harvest. Therefore, there has been a rise in Specialized Custom Plowers, Planters and Harvesters (SCPPH) teams (Zhang and Yang, 2012). These teams are all private. They own the machines themselves; some do not even have their own contract land or have rented out their own contract land. Most typically, SCPPH teams are made up of two to three family members. There is usually already a "going price" for the services (that is market driven). At any one particular time during the PPH seasons, there will be hundreds/thousands of these teams working the areas. There is almost never repeat business. All contracts are paid off in cash as soon as the work is done.

How much of this expansion of mechanization is due to the government's subsidy program? Of the 1160 households in Dataset 1, in 2008 216 of them owned some type of machine used for agricultural production (Table 5). The average value of the asset (at the time of purchase) was 2200 yuan (or about 300 US dollars). Many of the machines were worth even less than that. The average value of machines in the lowest quartile was 42.9 yuan or 6 US dollars

(row 1); and the average value of machines in the second lowest quartile was 176.9 yuan or 25 US dollars (row 2). The value of the machinery in the highest quartile (that is, for the most valuable machines) was 8366.5 yuan or about 1200 US dollars (row 4). On average, the total asset value of agricultural machinery for the farmers that owned machinery was 2408.9 yuan or about 320 US dollars (row 5). The average value of the machinery for all farmers in the sample (1160 households) was about 500 yuan per household or less than 100 US dollars.

According to our data, the new mechanization subsidy program supports on average 7.3% of the total purchase price of the machinery (Table 5, row 5, column 5). This means, on average, that machine-owning households received a subsidy worth 94 yuan or about 13 US dollars for purchasing their machines. When we asked farmers if this was an important part of their decision to buy a machine or not, they typically responded that the subsidy was not important. They stress that what is important is that they can save labor. The real savings in the purchase is made by negotiating hard with the equipment seller. They ask for high prices, but we can always negotiate them down.

In fact, only a small share of farmers in our sample ever received a mechanization subsidy (Table 5). According to our data, only seven machine-owning farmers out of 216 (or about 3% of machine owning farmers) received a subsidy. If we calculate this over the entire sample (1160 households), the share of farmers that receive machinery subsidies is about 0.5% (a half of one percent). Moreover, most of the subsidies went to farmers in the top income quartile (Table 5, rows 1–4).

It is not at all clear, however, if there is a true income-bias. The other feature, even for those who received the machinery subsidy, is that it only paid for a relatively small share of the machine. Of those in the top quartile that received a subsidy, their subsidy covered 24.4% of the purchase price (Table 5, row 4, column 5). Clearly, rising wages, more than subsidies, are driving equipment purchases. Hence, it might be that subsidies are not being given for less expensive machines (those bought by farmers with lower incomes) and that they are being reserved for larger machines which can only be purchased by higher income households (and which only make up a small overall share of machinery purchases).

The overall subsidy picture: summary and conclusions

Fig. 1 contains the most recent data on the total amount of subsidies offered to households over time for all of China's agriculture. From nearly 0 before 2002, farm subsidies rose from 100 million yuan (12.1 million US dollars) in 2002 to 140.6 billion yuan (22.3 billion US dollars) in 2011.

How big is this amount relative to agricultural GDP? In 2011, the Chinese National Bureau of Statistics (NBSC, 2012) reported agricultural GDP as 4.77 trillion yuan or 757 billion US dollars. This means that (dividing total agricultural GDP by total subsidies) that China's subsidy bill is 2.9% of agricultural GDP. As we have noted above, the total amount of support—both direct to households (the subject of this paper) and indirect to the farm sector (not covered by this paper)—is higher than 2.9%.

The total level of subsidies in this figure includes four main components: grain subsidies; input subsidies; seed subsidies and machinery subsidies. The direct subsidies were initially concentrated on major grains which are produced by nearly all farmers but only account for around 35% of the value of agricultural output (NBSC, 2005). The focus on grains was initially supposed to address food security concerns as well as poverty (China Daily, 2004; Han, 2011). Over time, grain subsidies per se have not risen very much. While they were the largest component in 2004, grain subsidies had become one of the smallest components of China's overall agricultural subsidies in 2011. However, in practice input subsidies and grain subsidies are given out together, and input subsidies are the largest and fastest growing component of the total subsidy amount. In other words, grain/input subsidies account for the majority of agricultural subsidies in the 2000s.

In the early 2000s, seed subsidies emerged and expanded. Seed subsidies (for crops such as soybean, cotton and rapeseed) are rising and now are nearly the same level as grain subsidies. Machinery subsidies have also risen. The level of seed and machinery subsidies, however, are still far less than the subsidies given for inputs. Interestingly, many of the subsectors of agriculture (e.g., livestock and fisheries) that account for large shares of GDP do not have large subsidy programs (although there is discussion of expanding subsidies to other subsectors in the upcoming 12th 5-year plan—State Council, 2012).

As seen in the grain/input subsidy component of our report, nearly all farmers are receiving subsidies. Indeed, in 2008 according to our nationally representative Dataset 1, 83.9% of farm households were receiving grain/input subsidies in 2008. The ones that did not receive these subsidies were typically farmers without contract land and a few others who lived in very rich, very fast growing counties on the east coast.

According to Datasets 1, an additional 3% of the sample households did not receive the grain/input subsidy but did receive another kind of subsidy (seed/mechanization/other). This means that according to our data, a total of 87% of China's households are receiving agricultural subsidies.

Clearly, China is following the path of tax to subsidy often taken by developing countries, as identified by economists. And, while there are many other subsidies, our paper shows that at least part of the subsidies from the state is making it to households. More fundamentally, our paper illustrates one of the changes in the nature of the relationship between state and farmer. In the past, the state exerted massive effort to collect taxes from all farm households. Those days are gone. Taxes fell from 8% or more in the 1990s and early 2000s to 0% after 2007. As this report shows, almost all farmers are now receiving subsidies.

Table 5
Machinery subsidies (MS) in China, 2008. *Source*: Authors' own survey (Dataset 1).

Categories[a]	HHs bought machine No.	Average expense on machine Yuan	Number of HHs with MS No.	Machinery subsidy (MS) Yuan	Proportion of MS to expense %
Lower quartile (<60 Yuan)	59	42.9	0	0	0
Median (60–400 Yuan)	50	176.6	0	0	0
3rd quartile (400–2055 Yuan)	53	1078.9	1	400	44.4
Upper quartile (2055Yuan>)	54	8366.5	6	3313.3	24.4
Overall	216	2408.9	7	2897.1	7.3

[a] The quartiles are calculated based on the expense of the machine bought by the sampled HHs.

Table A1
Description of the datasets used in this study.

Dataset	Covered subsidies	Study period	Survey regions	Source	Presented in tables
1	Grain Input Machinery	2008, 2009	Hebei, Shaanxi, Liaoning, Zhejiang, Hubei, Sichuan,	Authors' own survey (2009)	Table 1 Table 2 Table 5
2	Subsidies by commodities	2003–2008	National level	National Development and Reform Commission (2004–2009)	Table 3
3	Seed	2007	Henan, Shangdong, Hebei	Authors' own survey (2008)	Table 4, panel A
4	Seed	2007	Main cotton producing provinces	MOA (2008)	Table 4, panel B

Acknowledgements

We gratefully acknowledge the financial support by National Science Foundation of China (Grants: 71073155 and 71173204), Chinese Academy of Sciences (Grant: 2012RC102 and 2012ZD208), and China Institute of Rural Studies of Tsinghua University (Grant: CIRS2012-2). Usual disclaimer applies.

Appendix A.

Table A1.

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